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TARGET SYSTEM

The present invention relates to a target system provided with a pop-up target as defined in the preamble of claim 1.

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Target systems with pop-up targets designed for light infantry weapons comprise a metallic target, which falls down when hit by a bullet, and an actuating mechanism for actuating the target, i.e. for lifting it up again and moving it. The actuating mechanism may be protected by a shield plate placed

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in front of it. To control the actuating mechanism, a control apparatus provided with a computer may be connected to the actuating mechanism. Hits can be detected e.g. by using a hit detector arranged in conjunction with the target.

The actuating mechanism may be electrically operated, but it may also be operated pneumatically. A drawback with pneumatic target systems is their large size, which means that moving them e.g. for transportation requires transport equipment, and in addition, they often have to be immovably installed. Moreover, in connection with relocation of pneumatic systems, e.g. the pneumatic hoses and protection against fragments have to be renewed.

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An electrically operated target system provided with a pop-up target is disclosed in US patent specification 4,732,394. The system described in this specification comprises a vertical protective flange on the front side and another, horizontal flange behind it. The target is hinged at the upper edge of the vertical flange, and when hit by a bullet, it swings backwards into a horizontal rest position. A main shaft driven by an electric motor is mounted behind the protective flange. Mounted with a clutch mechanism on this shaft is a target raising arm, which, when the target is in the backward position, swings from its rest position upwardly and turns the target to an upright position.

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The system disclosed in the above US patent specification is relatively complicated. Moreover, it is relatively weak in construction e.g. because of the welded joints used in the target, so it will easily break and therefore does not tolerate hard use.

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The object of the present invention is to overcome the drawbacks of prior art and to achieve a new type of target system provided with a pop-up target and

actuated by an electric motor, which system is of very durable design and is additionally of modular construction.

5 In the target system of the invention, the target is attached to a carriage which moves on upright guide rails and is driven by an electrically operated actuating mechanism. When the carriage is driven up, the target is in an upright position and visible to the shooter. When the shooter hits the target, it falls down and disappears from view. The electric motor draws the carriage down, with the result that the target hits a lifter and rises to an upright position again. The
10 carriage remains in the low position hidden behind a protective armour, ready to raise the target again.

The features of the target system of the invention are presented in detail in the claims below.

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The target system of the invention is very simple and durable, especially because welded joints have been eliminated from the parts subject to stress, thus achieving a durable construction. In addition, the target system of the invention is of light weight, so it can be portable, and no special transport
20 equipment is needed for relocation of the target system. Thanks to the modular construction, individual parts are of light weight, typically below 20 kg, and e.g. broken or worn parts can be replaced in a rapid and simple manner. Thus, if necessary, a single person can move, assemble and disassemble the target system.

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Moreover, the target system of the invention makes it possible to implement a reactive and relocatable target system that can be used e.g. with a large variety of portable-firearm calibers.

30 In the following, the invention will be described in detail with reference to and example and the attached drawings, wherein

Fig. 1a presents an oblique rear view of a target system according to the invention,

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Fig. 1b a front view of a target system according to the invention without front armour, and

Fig. 2a – 2d present a target system according to the invention in different positions.

- 5 The target system presented in Fig. 1a and 1b consists of five main components: a target 3, a carriage 2, guide rails 6, an electric motor 1 with levers 4, 5 and a frame 7. The operation of the system is controlled by a control unit (not shown) provided with a computer. The target 3 is a steel plate impenetrable to a bullet.

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The motor 1 located in the lower part of the apparatus moves the carriage 2 along a pair of vertical guide rails 6 by means of levers 4, 5 connected to it. The target 3 is hinged at its lower end on the carriage by horizontal shaft 8 provided in the carriage and a transverse horizontal hole in the lower edge of the target.

- 15 The levers 4, 5 are connected to the rotating axle 10 of the motor 1 and to a pivot pin 11 at the lower edge of the carriage. In addition, the levers are connected to each other by a pivot pin 12. The motor 1 and the guide rails guiding the carriage may be fixedly mounted on the frame 7.

- 20 In position A (Fig. 2a), the carriage 2 is in its low position and the target 3 in an upright position but hidden behind a front armour 15. The carriage 2 is raised up by the motor 1, thus bringing the target to position B (Fig. 2b) so that it can be shot at. If the target 3 is not hit, then it is lowered along with the carriage 2 back to position A. If the target 3 is hit, then it falls down to position C (Fig. 2c), where
25 it is supported by a support part 13. The overturning is registered by a sensor connected to the control unit.

- When the carriage 2 is lowered to position D (Fig. 2d), the target 3 hits a lifter 14, which, powered by the motion of the carriage and the inertia of the target,
30 returns the target 3 to an upright position, and when the carriage 2 reaches the low position, the system is again in position A. The length of the rails 6 is so chosen that, in position A, the target 3 is completely hidden behind the front armour 15.

- 35 The support part 13 and the lifter may be solid or flexible. The support part 13 is located in a position where the translation and rotation of the target 3 are

simultaneously cancelled out. The functions of the support part 13 and the lifter 14 can also be integrated in a single component.

In the high position, the target is not strictly upright but slightly forward inclined.

5 This is a stable position and the target can not be overturned e.g. by the wind.

As described above, the target system implements the following three functions: target emerging into view, target disappearing from view, and immediate feedback from a hit as target is overturned or the like.

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The system consists of distinct modules that can be replaced with new ones when necessary. The target 3 may also consist of two parts 16, 17 attached to each other e.g. with bolts 19, of which parts the upper one is a target part 16 and the lower one a mounting part 17, which has a slot 18 in its upper edge for the target part and in its lower edge a hole 9 for a shaft 8 as mentioned above.

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The motor 1 used as a power means can be easily carried along and, when necessary, a likewise portable accumulator can be used a power source.

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It is obvious to the person skilled in the art that different embodiments of the invention are not limited to the example described above, but that they may be varied within the scope of the claims presented below. The electric motor may also be a linear motor, in which case no lever arms are needed.

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CLAIMS

1. Target system provided with a pop-up target, said system comprising:
a target (3) overturnable by an impact and an actuating mechanism for moving
5 the target (3),
said target being connected to the actuating mechanism by a pivot structure
(8,9), and
said actuating mechanism comprising a lifter for lifting the target to an upright
position and an electric motor (1) for moving the lifter,
10 **characterized** in that the actuating mechanism comprises a vertical rail system
(6) and a carriage part (2) vertically movable along it by the electric motor, said
pivot structure (8,9) being arranged on said carriage part, and that
the lifter is a supporting lifter device (13, 14), against which the target falls when
hit and which, when the carriage (2) is lowered, lifts the target to an upright
15 position substantially by utilizing the movement of the carriage and the inertia of
the target.
2. System according to claim 1, **characterized** in that the supporting lifter
consists of a support part (13) and a lifter part (14) as separate parts.
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3. System according to claim 1 or 2, **characterized** in that the supporting lifter is
solid or flexible.
4. System according to claim 1 or 2, **characterized** in that the supporting lifter is
25 disposed at a position where the translation and rotation of the target (3) are
cancelled out simultaneously, or close to such a position.
5. System according to claim 1, **characterized** in that the target (3) consists of
two parts (16, 17) attached to each other by fastening elements, the upper one
30 of said parts being a plate-like target part (16) and the lower one a mounting
part (17) provided with a pivot structure (8,9).
6. System according to claim 5, **characterized** in that the upper edge of the
mounting part (17) is provided with a slot (18) for the target part.
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7. System according to claim 1, comprising a substantially plate-like protective
armour (15) on its front side, **characterized** in that the rail system (6) extends to

a height such that the target in its low position (position A) is completely hidden behind the protective armour.

8. Target system provided with a pop-up target, said system comprising:

- 5 a target (3) overturnable by an impact and an actuating mechanism for moving the target (3), said target being connected to the actuating mechanism by a pivot structure (8,9), and
- said actuating mechanism comprising a lifter for lifting the target to an upright position and an electric motor (1) for moving the lifter,
- 10 **characterized** in that the actuating mechanism comprises a vertical rail system (6) and a carriage part (2) vertically movable along it by the electric motor, said pivot structure (8,9) being arranged on said carriage part, and that
- the lifter is a supporting lifter device (13, 14), against which the target falls when hit and which, when the carriage (2) is lowered, lifts the target to an upright
- 15 position substantially by utilizing the movement of the carriage and the inertia of the target, and that
- the system is of modular construction, consisting of detachable, e.g. replaceable parts, which are joined together without welded joints or equivalent.

- 20 9. System according to claim 8, **characterized** in that the target (3) consists of two parts (16, 17) attached to each other by fastening elements, the upper one of said parts being a plate-like target part (16) and the lower one a mounting part (17) provided with a pivot structure (8,9).